

Trends of gestational age-related anthropometric parameters of newborns in tertiary care center

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ABSTRACT

Aim. The current study aimed to determine the pattern of birth weights, lengths and occipitofrontal circumference of babies born in tertiary center.

Method. Length, occipitofrontal circumference and weight of babies were collected from medical records over last 5 years. These parameters were then plotted in growth chart to find out the nomogram of babies born in our center.

Results. A total of 3169 babies (1482 males and 1687 females) were studied. The overall mean birth weight (\pm standard deviation (SD)) was 2994 \pm 419 g, the mean \pm SD length 49.4 \pm 2.3 cm, the mean \pm SD OFC 33.7 \pm 1.7 cm.

Conclusion. According to NFHS 5, 17% had low birth weight in Tamil Nadu, which is comparatively higher than our study (7.6%). This suggest that with improved care to the antenatal mothers we can reduce the incidence of low-birth-weight babies.

Keywords: anthropometry, newborn, occipitofrontal circumference

INTRODUCTION

Newborns are generally classified according to their gestational age/birth weight, the former being the strongest determinant of birth weight and post-natal survival [1,2]. Birth weight, length and occipitofrontal circumference (OFC) of newborn babies are significant markers for assessing intra-uterine development [3]. Infants with low or high birth weight have significantly high morbidity and mortality than in infants with appropriate weight for gestational age, and to have an increased risk of complications such as birth asphyxia and trauma during delivery [3,4]. A recent study has shown that increase in birth length is also a predictor of perinatal mortality. Infants with increased birth length were at higher risk of perinatal death [5]. Infants born with small or large heads may have malformations of the central nervous system secondary to genetic or chromosomal abnormalities, or teratogenic insults with worst prognosis. There is lack of data on the anthropometric parameters of newborn infants in most parts of the developing world. The current

study aimed to determine the pattern of birth weights, lengths and occipitofrontal circumference of babies born in our center.

MATERIALS AND METHODS

This retrospective study was conducted in Chettinad hospital and research institute, Kelambakkam. The study period was between April 2017 to April 2022. Approval from human ethics committee was obtained. All term babies born in Chettinad hospital during the study period were included. Babies with gestational age less than 37 weeks were excluded. Length, occipitofrontal circumference and weight of babies were collected from medical records over last 5 years. These parameters were then plotted in growth chart (intergrowth chart [6]) to find out the nomogram of babies born in our center. Descriptive and inferential statistics were appropriately applied during analysis using Pearson's chi-square test, student's t-test and analysis of variance (anova). Any p-value <0.05 was considered statistically significant (95% confidence level).

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RESULTS

There were a total of 3730 live births at Chettinad hospital between the years April 2017 to April 2022. Of this, 561 preterm babies were excluded from the study. The present study included 3169 live full-term newborns more than or equal to 37 - 42 weeks of completed gestational age with 1687 females and 1482 males. Figure 1 and 2 shows the gestational age and mode of delivery.

The overall mean \pm SD birth weight was 2994 \pm 419 g. The mean \pm SD for occipitofrontal circumference and length were 33.7 \pm 1.7 cm and 49.4 \pm 2.3 cm. The overall mean anthropometric measurements were higher in female babies than male babies, which was statistically significant (Table 1).

TABLE 1. Anthropometric measurements of term newborn by sex

Sex		Mean	SD	P VALUE
Length	Boy	49.2	2.3	0.0005
	Girl	49.6	2.2	
Weight	Boy	2952.1	418.7	0.0005
	Girl	3031.6	416.8	
HC	Boy	33.5	1.8	0.0005
	Girl	33.8	1.7	



FIGURE 1. Gestational age

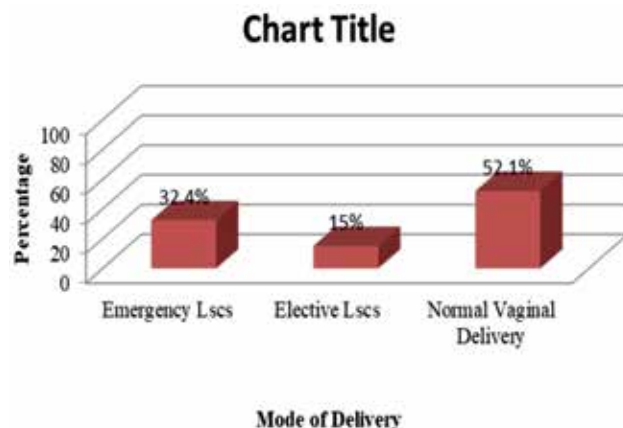


FIGURE 2. Mode of delivery

TABLE 2. Anthropometric measurements of term newborn by gestational age and sex

Gestational age		Sex	Mean	SD
37	Length	Boy	48.6	2.4
		Girl	48.7	2.0
	Weight	Boy	2799.9	448.1
		Girl	2848.0	418.5
	Head Circumference	Boy	33.2	1.4
		Girl	33.3	1.4
38	Length	Boy	49.1	2.3
		Girl	49.5	2.1
	Weight	Boy	2958.7	432.0
		Girl	2978.4	404.0
	Head Circumference	Boy	33.5	1.7
		Girl	33.7	1.6
39	Length	Boy	49.5	2.3
		Girl	50.0	2.3
	Weight	Boy	2981.7	369.2
		Girl	3137.9	397.5
	Head Circumference	Boy	33.7	2.0
		Girl	33.9	1.8
40	Length	Boy	49.7	1.9
		Girl	50.2	2.2
	Weight	Boy	3246.9	2138.4
		Girl	3220.6	387.1
	Head Circumference	Boy	33.8	1.6
		Girl	34.3	2.0
41	Length	Boy	48.8	2.4
		Girl	50.1	1.5
	Weight	Boy	2782.5	490.7
		Girl	3132.5	321.2
	Head Circumference	Boy	32.5	1.9
		Girl	32.8	1.7

The babies were then classified according to intra-uterine growth. Less than 10% of subjects had measurements below the 10th percentile and above 90th percentile for any of the parameters. Of the infants, 230 (7.6%) had birth weight less than 10th percentile in the intergrowth chart [6] and were therefore classified as small for gestational age. The corresponding figures for appropriate for gestational age (10th - 90th percentile) and large for gestational age (>90th percentile) babies were 2768 (86.6%) and 175 (5.8%), respectively (Table 3).

TABLE 3. Distribution of anthropometric parameters using intergrowth chart [6]

Measurement	<10 th centile	10 th - 90 th centile	>90 th centile
Birth weight (g)	230(7.6)	2764(86.6%)	175(5.8%)
Length (cm)	308(9.7%)	2413(80.5%)	312(9.8%)
OFC (cm)	312(9.8%)	2485(82.1%)	257(8.1%)

Figures 3-5 show the selected percentile graphs (10th, mean, 90th) for birth length, weight, and occipitofrontal circumference, respectively, at 37, 38,

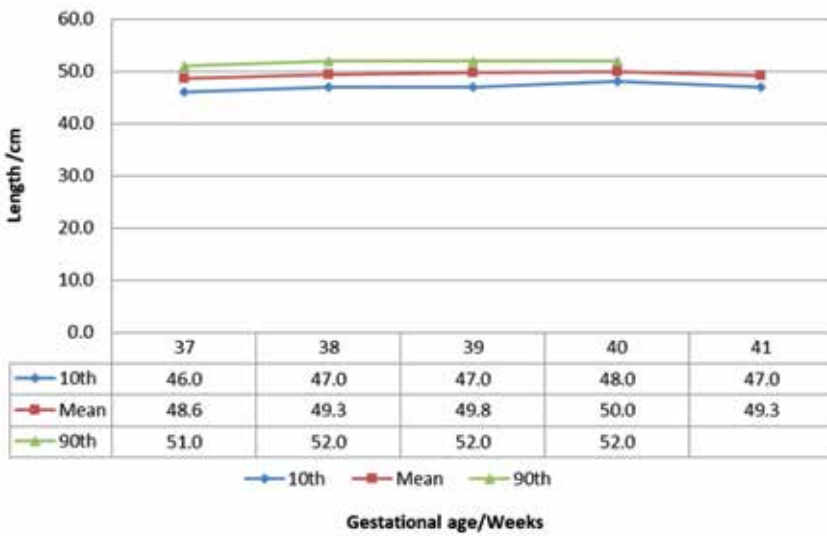


FIGURE 3. Selected percentile graphs of length in relation to gestational age

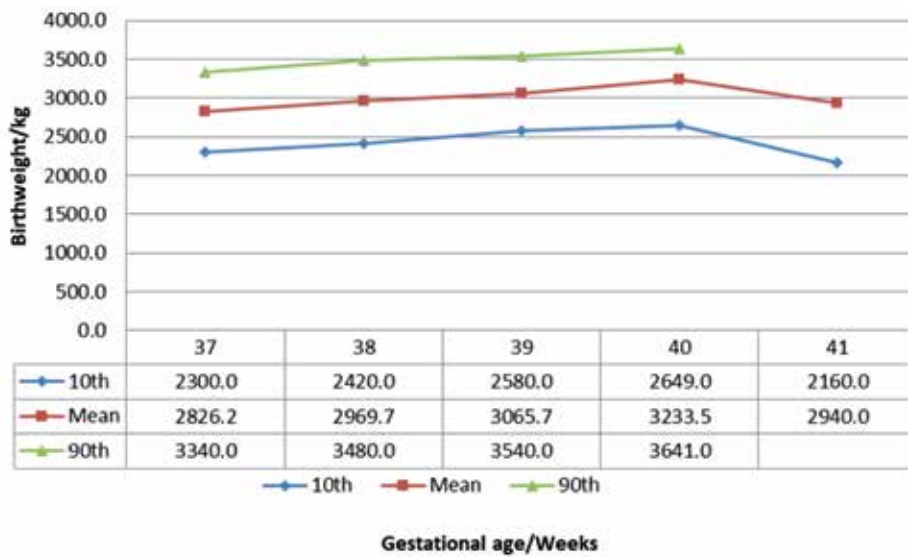


FIGURE 4. Selected percentile graphs of birth weight in relation to gestational age

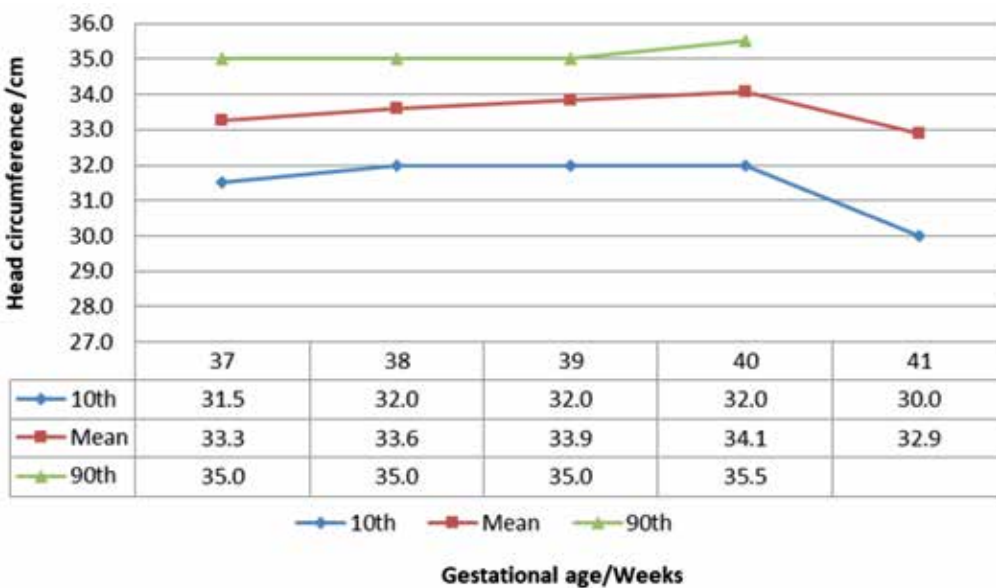


FIGURE 5. Selected percentile graphs of occipitofrontal circumference in relation to gestational age

39, 40 and 41 weeks of gestation. Mean birth weight increased progressively until 40 weeks' gestation, showing a slight decrease at 41 weeks. Length and occipitofrontal circumference also increased progressively but showed a slight drop at 41 weeks.

DISCUSSION

This study determined the weight, length and head circumference of term newborn babies born in a tertiary care center. The overall mean birth weight and SD of 2994 ± 419 g in the current study, which was higher than the other Indian studies. In the study conducted by Villar et al the mean birth weight in India neonates was 2900 g, however it was lower than other countries in the same study [6]. In a study conducted by Yajnik et al. in rural part of India and Huque et al. in Bangladesh, the mean birth weight and SD (2666 ± 355 g and 2679 ± 431 g) was lower than the current study [7,8]. The mean birth weight in a study conducted in Bangalore and Khammam was $\{2.81 (2.51-3.10) \text{ kg}, 2667.44 \pm 365.65 \text{ g}\}$ lower than the current study [9,10]. However, in the study conducted by Kheir et al. in Khartoum state and Ba-Saddik et al. in Yemen, the mean birth weight (3140 g and 3133 g) was higher to our study [11,12]. Usually, the birth weight tends to vary in each Centre, this variation is attributable to many factors. One factor could be socioeconomic class. In high socioeconomic class birth weight tends to be higher, this explains the reason for the higher mean birth weight in our study compared to other studies in rural part of India [7,8]. Access to health care is another important factor which is readily available in urban city. Our study was conducted in urban city

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involving middle to higher socioeconomic class. Other factors could be geographical variations, genetics or racial differences [13,14].

The mean length of babies in current study was 49.4cm is comparable to study done by Villar et al in 9 countries [6]. Birth length of 48.91 cm in Yemen [9], 48.7 cm in Khartoum state [11] were reported. It is, however, much higher than the 47.7 cm reported from Pune in India [7].

The mean occipitofrontal circumference of babies in current study was 33.7cm is comparable to study done by Villar et al in 9 countries. OFC of 33.78 in Yemen [12], 34.08 in Khammam [10], 34.4 cm in Khartoum state [11] were reported, which were all similar to our study.

230 (7.6%) of 3169 term babies in our study were small for gestational age 175(5.8%) were large for gestational age compared to 7.2% and 15.9% in Nigerian study [15]. In the study done by Ba-Saddik et al, 12.7% were SGA and 12.6% were LGA [12].

STRENGTH AND LIMITATION

The large sample size in our study is strength. Since anthropometric measurements were made by different doctors, interobserver variation is possible limitation of our study.

CONCLUSION

According to NFHS 5, 17% had low birth weight in Tamil Nadu, which is comparatively higher than our study (7.6%). This suggest that with improved care to the antenatal mothers we can reduce the incidence of low birth weight babies.

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